# Silicon Diffused Power Transistor — BU2525AF

## GENERAL DESCRIPTION

New generation, high-voltage, high-speed switching npn transistor in a plastic full-pack envelope intended for use in horizontal deflection circuits of large screen colour television receivers up to 32 kHz.

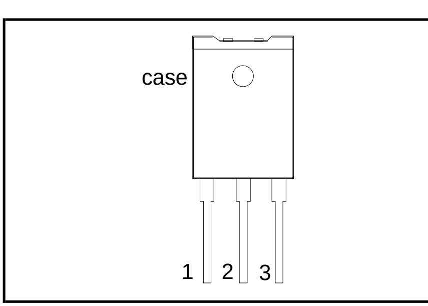
## QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{CESM}$ | Collector-emitter voltage peak value | $V_{BE}$ = 0 V | - | 1500 | V |
| $V_{CEO}$ | Collector-emitter voltage (open base) | | - | 800 | V |
| $I_C$ | Collector current (DC) | | - | 12 | A |
| $I_{CM}$ | Collector current peak value | | - | 30 | A |
| $P_{tot}$ | Total power dissipation | $T_{hs} \leq 25$ ˚C | - | 45 | W |
| $V_{CEsat}$ | Collector-emitter saturation voltage | $I_C$ = 8.0 A; $I_B$ = 1.6 A | - | 5.0 | V |
| $I_{Csat}$ | Collector saturation current | | 8.0 | - | A |
| $t_f$ | Fall time | $I_{CM}$ = 8.0 A; $I_{B(end)}$ = 1.1 A | 0.2 | 0.35 | µs |

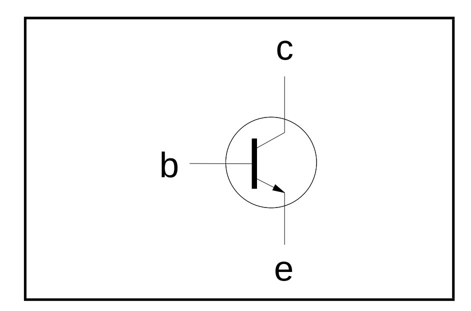
## PINNING - SOT199

| PIN | DESCRIPTION |
|---|---|
| 1 | base |
| 2 | collector |
| 3 | emitter |
| case | isolated |

## PIN CONFIGURATION




## SYMBOL




## LIMITING VALUES

Limiting values in accordance with the Absolute Maximum Rating System (IEC 134)

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{CESM}$ | Collector-emitter voltage peak value | $V_{BE}$ = 0 V | - | 1500 | V |
| $V_{CEO}$ | Collector-emitter voltage (open base) | | - | 800 | V |
| $I_C$ | Collector current (DC) | | - | 12 | A |
| $I_{CM}$ | Collector current peak value | | - | 30 | A |
| $I_B$ | Base current (DC) | | - | 8 | A |
| $I_{BM}$ | Base current peak value | | - | 12 | A |
| $-I_{B(AV)}$ | Reverse base current | average over any 20 ms period | - | 200 | mA |
| $-I_{BM}$ | Reverse base current peak value [1] | | - | 7 | A |
| $P_{tot}$ | Total power dissipation | $T_{hs} \leq$ 25 ˚C | - | 45 | W |
| $T_{stg}$ | Storage temperature | | -65 | 150 | ˚C |
| $T_j$ | Junction temperature | | - | 150 | ˚C |

## THERMAL RESISTANCES

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| $R_{th\ j\text{-}hs}$ | Junction to heatsink | without heatsink compound | - | 3.7 | K/W |
| $R_{th\ j\text{-}hs}$ | Junction to heatsink | with heatsink compound | - | 2.8 | K/W |
| $R_{th\ j\text{-}a}$ | Junction to ambient | in free air | 35 | - | K/W |

**1** Turn-off current.

## ISOLATION LIMITING VALUE & CHARACTERISTIC

$T_{hs}$ = 25 ˚C unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $V_{isol}$ | Repetitive peak voltage from all three terminals to external heatsink | R.H. ≤ 65 % ; clean and dustfree | - | | 2500 | V |
| $C_{isol}$ | Capacitance from T2 to external heatsink | f = 1 MHz | - | 22 | - | pF |

## STATIC CHARACTERISTICS

$T_{hs}$ = 25 ˚C unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $I_{CES}$ | Collector cut-off current [2] | $V_{BE}$ = 0 V; $V_{CE}$ = $V_{CESMmax}$ | - | - | 1.0 | mA |
| $I_{CES}$ | | $V_{BE}$ = 0 V; $V_{CE}$ = $V_{CESMmax}$; $T_j$ = 125 ˚C | - | - | 2.0 | mA |
| $I_{EBO}$ | Emitter cut-off current | $V_{EB}$ = 7.5 V; $I_C$ = 0 A | - | - | 1.0 | mA |
| $BV_{EBO}$ | Emitter-base breakdown voltage | $I_B$ = 1 mA | 7.5 | 13.5 | - | V |
| $V_{CEOsust}$ | Collector-emitter sustaining voltage | $I_B$ = 0 A; $I_C$ = 100 mA; L = 25 mH | 800 | - | - | V |
| $V_{CEsat}$ | Collector-emitter saturation voltage | $I_C$ = 8.0 A; $I_B$ = 1.6 A | - | - | 5.0 | V |
| $V_{BEsat}$ | Base-emitter saturation voltage | $I_C$ = 8.0 A; $I_B$ = 1.6 A | - | - | 1.3 | V |
| $h_{FE}$ | DC current gain | $I_C$ = 100 mA; $V_{CE}$ = 5 V | 6 | 13 | 26 | |
| $h_{FE}$ | | $I_C$ = 8 A; $V_{CE}$ = 5 V | 5 | 7 | 10 | |

## DYNAMIC CHARACTERISTICS

$T_{hs}$ = 25 ˚C unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| $C_c$ | Collector capacitance | $I_E$ = 0 A; $V_{CB}$ = 10 V; f = 1 MHz | 145 | - | pF |
| | Switching times (32 kHz line deflection circuit) | $I_{CM}$ = 8.0 A; $L_C$ = 260 µH; $C_{fb}$ = 13 nF; $I_{B(end)}$ = 1.1 A; $L_B$ = 2.5 µH; $-V_{BB}$ = 4 V; ($-dI_B/dt$ = 1.6 A/µs) | | | |
| $t_s$ | Turn-off storage time | | 3.0 | 4.0 | µs |
| $t_f$ | Turn-off fall time | | 0.2 | 0.35 | µs |

**2** Measured with half sine-wave voltage (curve tracer).

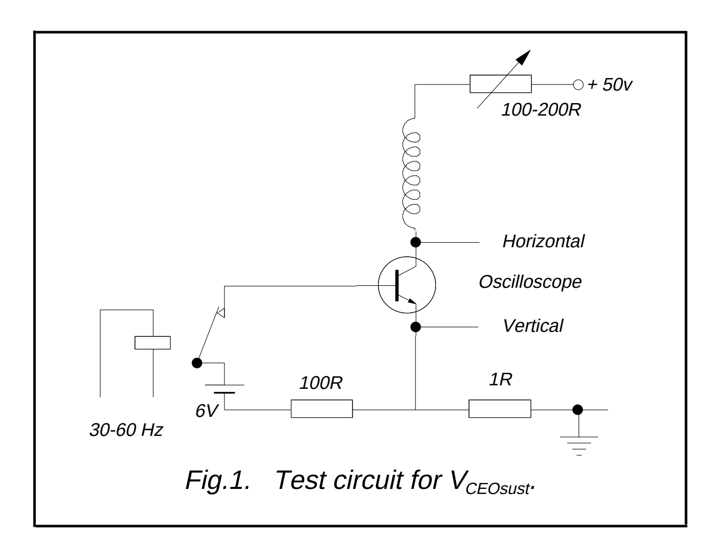



Fig.1. Test circuit for $V_{CEOsust}$.

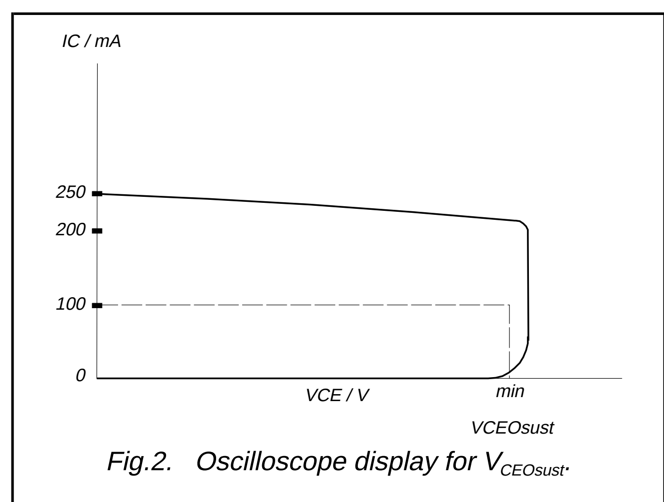



Fig.2. Oscilloscope display for $V_{CEOsust}$.

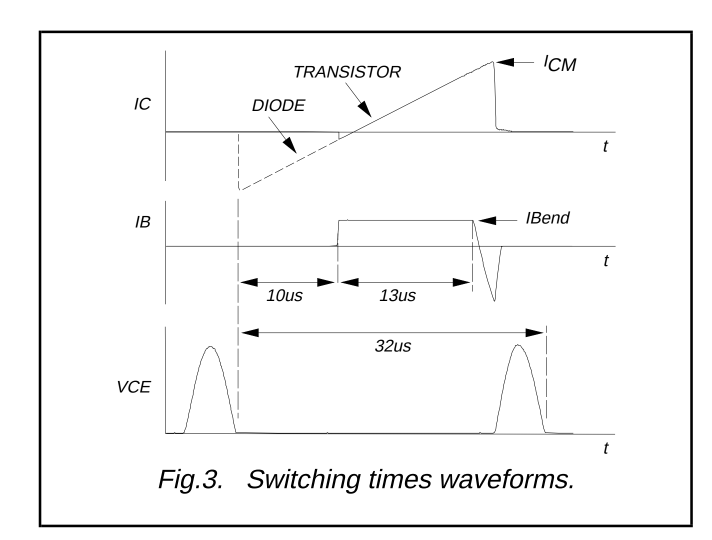



Fig.3. Switching times waveforms.

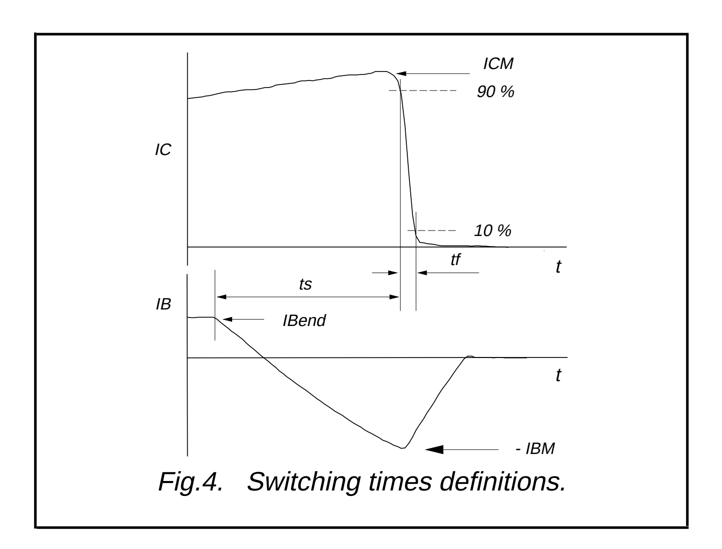



Fig.4. Switching times definitions.

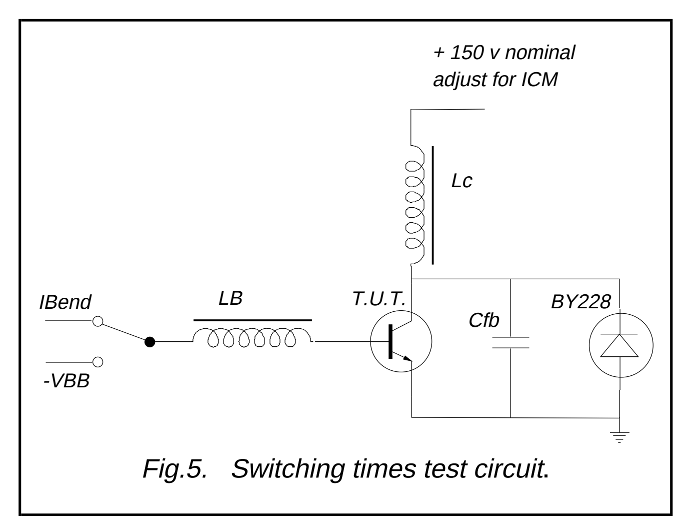



Fig.5. Switching times test circuit.

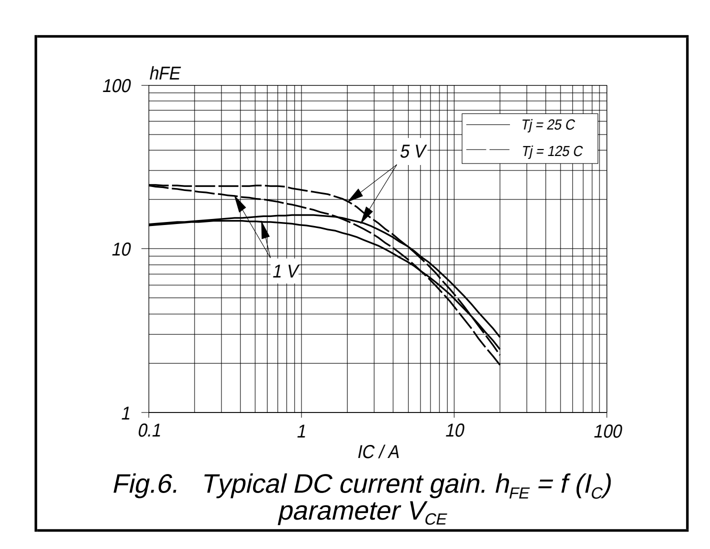



Fig.6. Typical DC current gain. $h_{FE} = f\ (I_C)$ parameter $V_{CE}$

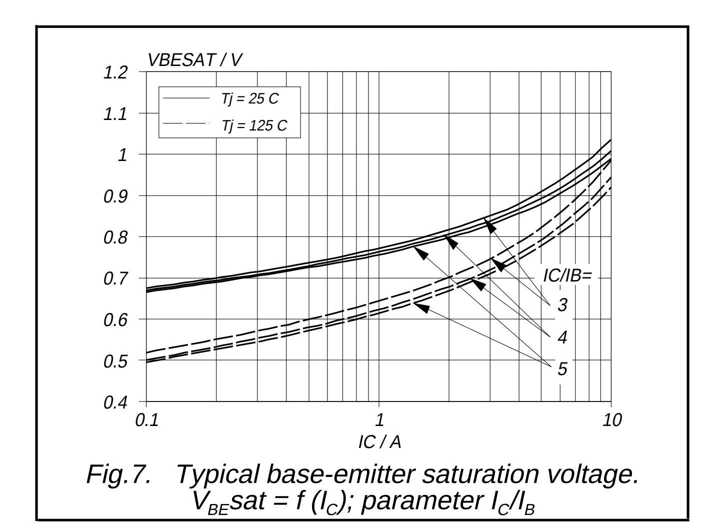



*Fig.7. Typical base-emitter saturation voltage.*
*$V_{BE}sat = f(I_C)$; parameter $I_C/I_B$*

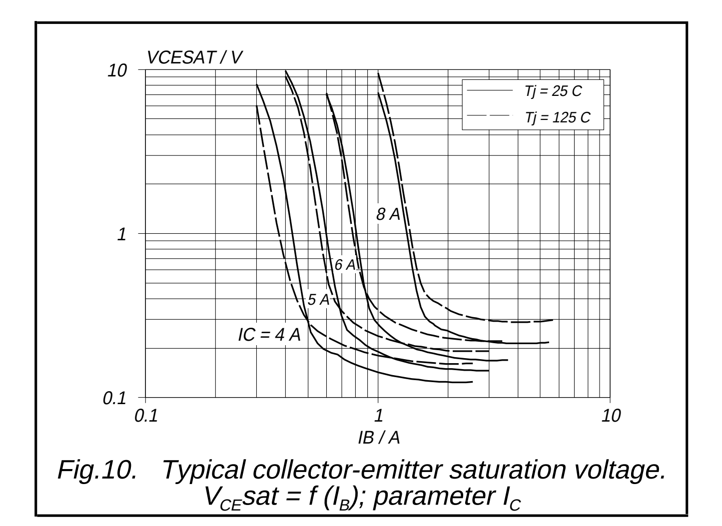



*Fig.10. Typical collector-emitter saturation voltage.*
*$V_{CE}sat = f(I_B)$; parameter $I_C$*

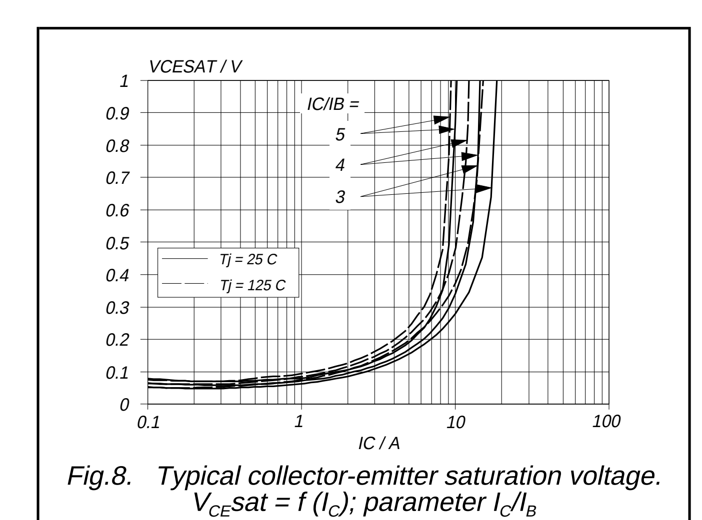



*Fig.8. Typical collector-emitter saturation voltage.*
*$V_{CE}sat = f(I_C)$; parameter $I_C/I_B$*

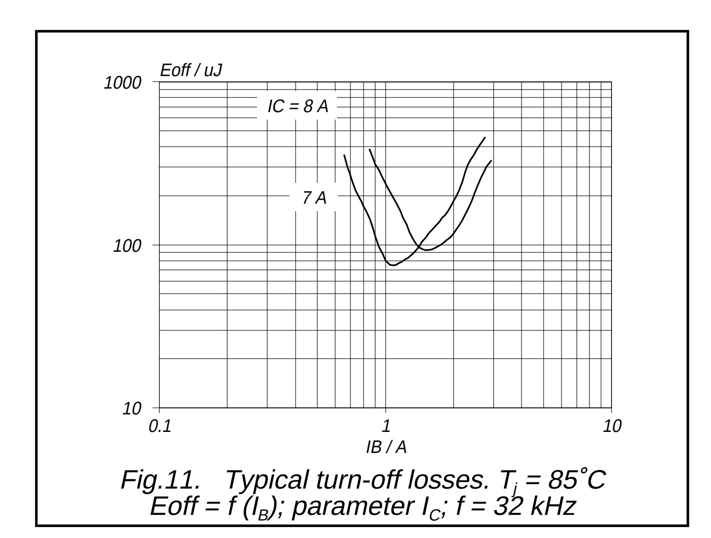



*Fig.11. Typical turn-off losses. $T_j = 85^{\circ}C$*
*$Eoff = f(I_B)$; parameter $I_C$; $f = 32$ kHz*

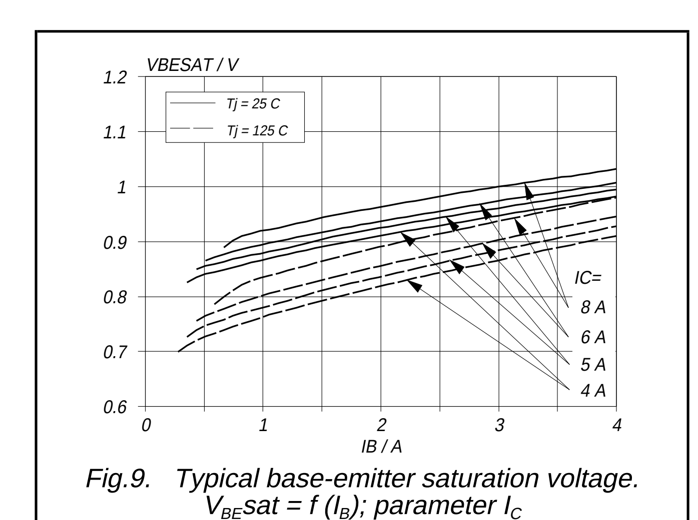



*Fig.9. Typical base-emitter saturation voltage.*
*$V_{BE}sat = f(I_B)$; parameter $I_C$*

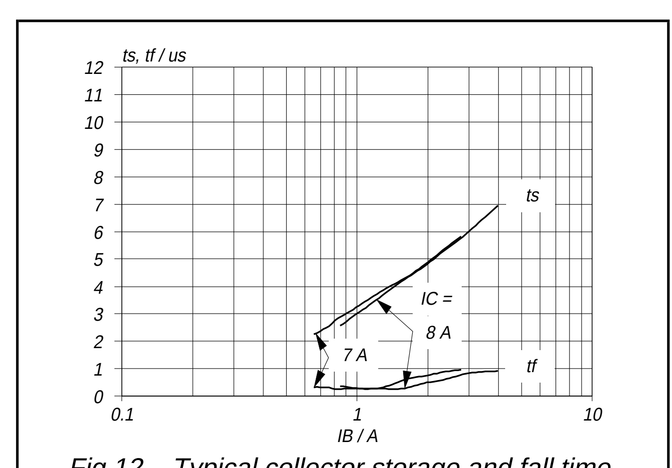



*Fig.12. Typical collector storage and fall time.*
*$ts = f(I_B)$; $tf = f(I_B)$; parameter $I_C$; $T_j = 85^{\circ}C$; $f = 32$ kHz*

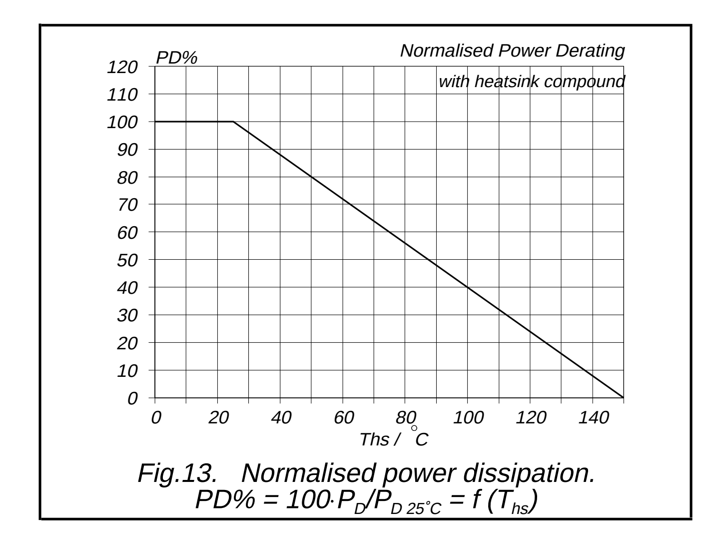



Fig.13. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25^\circ C} = f\,(T_{hs})$

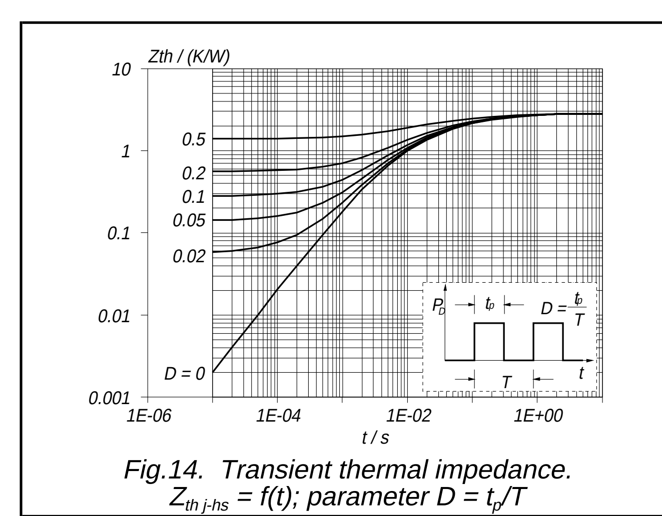



Fig.14. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

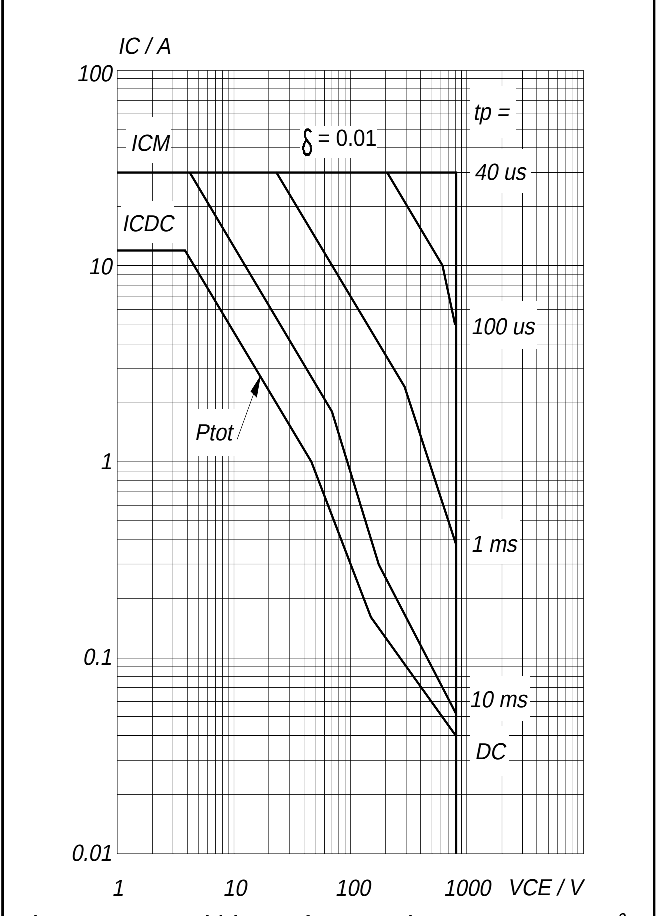



Fig.15. Forward bias safe operating area. $T_{hs} = 25\ ^\circ C$
$I_{CDC}$ & $I_{CM} = f(V_{CE})$; $I_{CM}$ single pulse; parameter $t_p$
Second-breakdown limits independant of temperature.
Mounted with heatsink compound.

## MECHANICAL DATA

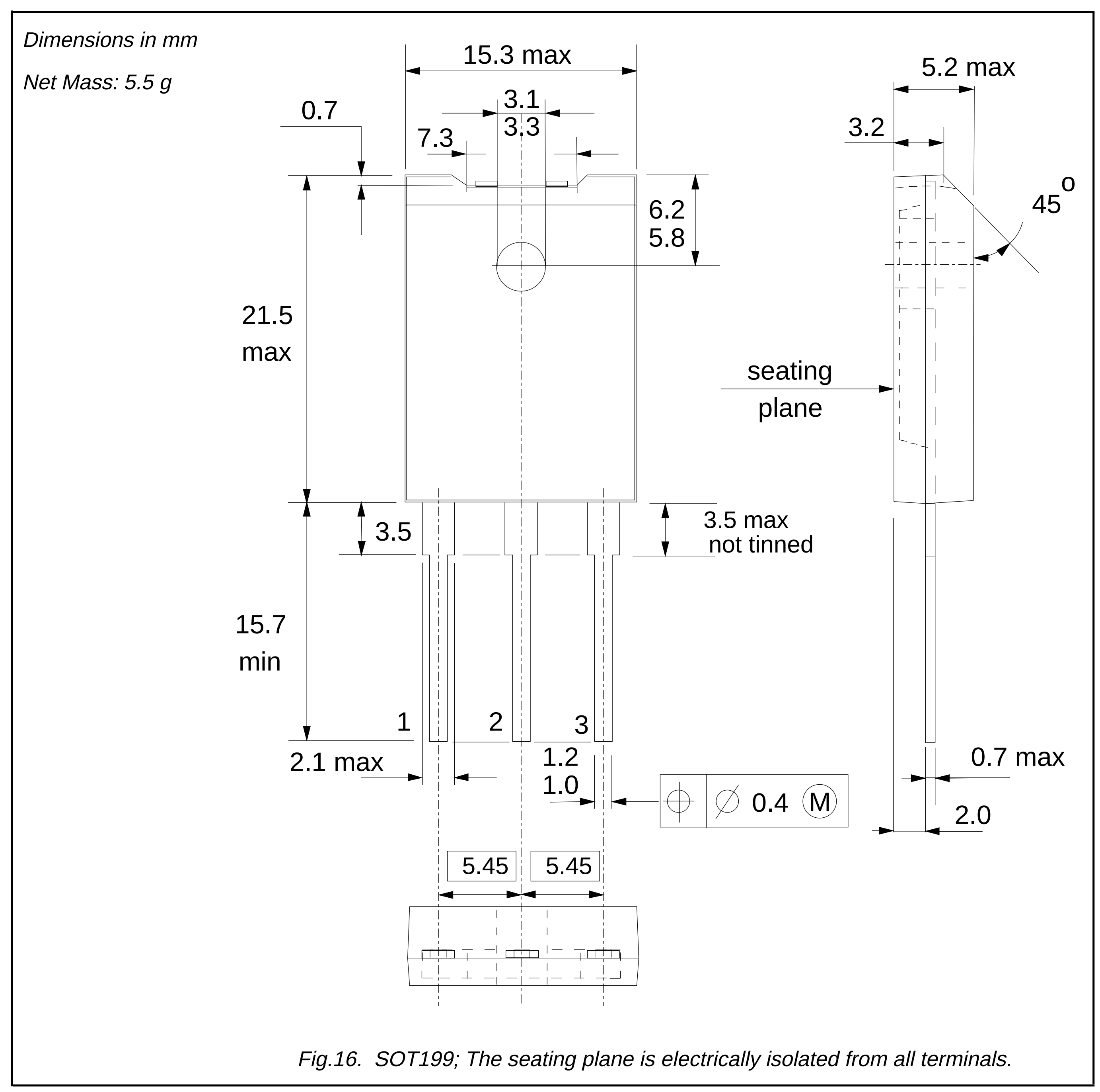



*Fig.16. SOT199; The seating plane is electrically isolated from all terminals.*

**Notes**
1. Refer to mounting instructions for F-pack envelopes.
2. Epoxy meets UL94 V0 at 1/8".

## DEFINITIONS

| Data sheet status | |
|---|---|
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specifications. |
| **Limiting values** | |
| Limiting values are given in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability. | |
| **Application information** | |
| Where application information is given, it is advisory and does not form part of the specification. | |



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